

NON-PUBLIC?: N  
ACCESSION #: 9206230107  
LICENSEE EVENT REPORT (LER)

FACILITY NAME: SAN ONOFRE NUCLEAR GENERATING STATION PAGE: 1  
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UNIT 3

DOCKET NUMBER: 05000362

TITLE: AUTOMATIC UNIT 3 REACTOR TRIP DUE TO FAILED REACTOR  
COOLANT PUMP  
MOTOR SURGE CAPACITOR  
EVENT DATE: 05/15/92 LER #: 92-003-00 REPORT DATE: 06/15/92

OTHER FACILITIES INVOLVED: NONE DOCKET NO: 05000

OPERATING MODE: 1 POWER LEVEL: 100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR  
SECTION:  
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:  
NAME: R. W. Krieger, Station Manager TELEPHONE: (714) 368-6255

COMPONENT FAILURE DESCRIPTION:  
CAUSE: X SYSTEM: EA COMPONENT: CAP MANUFACTURER: W120  
REPORTABLE NPRDS: Y

SUPPLEMENTAL REPORT EXPECTED: NO

ABSTRACT:

At 1006 on May 15, 1992, with Unit 3 at 100% power, reactor coolant pump (RCP) 3P003 tripped, causing an automatic reactor trip on a low departure from nucleate boiling ratio (DNBR) signal. The plant was stabilized in Mode 3 at approximately 1020. Emergency feedwater actuation signals (EFAS) were generated for both steam generators (SGs) due to the expected decrease in SG level following the trip. There is no safety significance to this event since all reactor protection system and EFAS components actuated as designed.

A short circuit failure of the RCP 3P003 motor phase "C" surge protection capacitor occurred due to long term, vibration-induced abrasion damage to the mylar plastic insulation within the capacitor assembly.

The RCP motor preventive maintenance program will be modified to include periodic replacement of the capacitors. The surge capacitors for the Unit 2 RCPs will be replaced during the next outage of sufficient duration.

END OF ABSTRACT

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Plant: San Onofre Nuclear Generating Station  
Unit: Three

Reactor Vendor: Combustion Engineering  
Event Date: 05-15-92  
Time: 1006

A. CONDITIONS AT TIME OF THE EVENT:

Mode: 1, Power Operation, 100% reactor power

B. BACKGROUND INFORMATION:

1. Reactor Coolant Pumps (RCPs) P!:

Four RCPs are provided to circulate coolant through the reactor coolant system (RCS) AB!. Each RCP motor is provided with a set of surge capacitors CAP! (one for each motor winding phase) to prevent damage to the RCP motor windings during voltage transients. A short circuit across one (or more) of these capacitors would result in a trip of the RCP due to a sensed neutral differential overcurrent condition. The RCPs are not required to operate to mitigate the consequences of any design basis accident; therefore, the RCP motor surge capacitors are non-safety related equipment.

2. Reactor Protection System (RPS) JC!:

The core protection calculators (CPCs), which are part of the RPS, calculate departure from nucleate boiling ratio (DNBR) based on calculated reactor power and RCS flow. RCS flow is calculated based on RCP speed. A trip of an RCP would result in the CPCs generating a reactor trip signal on low DNBR.

3. Feedwater Control System (FWCS) JB!:

The FWCS is the non-safety related control system that automatically maintains steam generator (SG) SG! levels during power operation. In addition, following a reactor trip, the FWCS generates a reactor tripped override (RTO) signal to minimize plant cooldown and recover SG levels. An RTO signal causes: 1) the two main feedwater pumps (MFPs) SJ,P! to decrease speed from approximately 4700 rpm to 3600 rpm, 2) the two main feedwater regulating valves (MFRVs) FCV! to close, and 3) the two main feedwater regulating bypass valves (MFBVs) FCV! to reposition from fully open to approximately 50 percent open.

Following a reactor trip from 100% power, SG level normally decreases below the emergency feedwater actuation system (EFAS) actuation setpoint, initiating the auxiliary feedwater system (AFWS). The AFWS is designed to provide all of the feedwater requirements, if necessary due to loss of main feedwater, for decay heat removal following a reactor trip.

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#### 4. MFP High Discharge Pressure Trip:

Both MFPs will automatically trip if the MFP common discharge header pressure reaches 1500 psig. The normal discharge header pressure during full power operation is approximately 1050 psig. Following a reactor trip from 100% power, the peak MFP discharge header pressure normally increases to a range of approximately 1150 to 1200 psig.

### C. DESCRIPTION OF THE EVENT:

#### 1. Event:

At 1006 on May 15, 1992, with Unit 3 at 10096 power, RCP 3P003 tripped, causing an automatic reactor trip on low DNBR. The plant was stabilized in Mode 3 by approximately 1020.

EFAS signals were generated for both SGs due to the expected decrease in SG level following the trip. All AFWS components actuated as designed.

#### 2. Inoperable Structures, Systems or Components that Contributed to the Event:

None.

### 3. Sequence of Events:

#### TIME ACTION

1006 Automatic reactor trip occurred.

approx-1020 Plant conditions were stabilized.

### 4. Method of Discovery:

Control room alarms and indications alerted the control room operators (utility, licensed) to the RCP 3P003 trip and the reactor trip.

### 5. Personnel Actions and Analysis of Actions:

Control room operators responded properly to the reactor trip, implementing normal post-trip procedures to stabilize the plant in Mode 3.

Control room operators also properly verified correct system response to the EFAS signals.

### 6. Safety System Responses:

The RPS and EFAS (AFWS) components actuated as designed.

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## D. CAUSE OF THE EVENT:

### 1. Immediate Cause:

RCP 3P003 tripped due to phase "C" differential relay operation on the RCP supply breaker. This caused a reactor trip signal to be generated by the CPCs on low DNBR.

### 2. Root Cause:

A short circuit failure of the RCP 3P003 motor phase "C" surge protection capacitor occurred due to long term vibration-induced abrasion damage to the mylar plastic insulation within the capacitor assembly. The vibration was a result of normal operation of 3P003. The surge capacitors in the other Unit 3 RCPs were found to be degraded as well,

although not to the extent of the 3P003 motor phase "C" capacitor.

The capacitors had been installed during initial plant operation in the early 1980's. A periodic inspection of the capacitors was accomplished on a refueling interval in accordance with the RCP motor vendor's service manual. However, this inspection was ineffective in identifying incipient failure because the inspection was for an oil-filled capacitor rather than the dry type capacitor actually installed.

SCE has identified that under normal usage conditions, the recommended in-service life for the RCP motor surge capacitors is four years. Although available as early as 1987, this information was not included in the RCP motor vendor manual.

#### E. CORRECTIVE ACTIONS:

##### 1. Corrective Actions Taken:

- a. The surge capacitors for all four Unit 3 RCPs were replaced with in-kind parts. The capacitors were subjected to the overvoltage test and capacitance measurement prior to their installation.
- b. The RCP motor vendor manual has been changed to include an appropriate periodic examination, including an overvoltage test and capacitance measurement, of the surge capacitors.

##### 2. Planned Corrective Actions:

- a. The RCP motor preventive maintenance program will be modified to include an appropriate periodic examination of the surge capacitors.

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- b. The surge capacitors will be periodically replaced.
- c. The surge capacitors for the Unit 2 RCPs will be replaced during the next outage of sufficient duration.

#### F. SAFETY SIGNIFICANCE OF THE EVENT:

There is minimal safety significance to this event since all RPS and

EFAS (AFWS) components actuated in accordance with design.

G. ADDITIONAL INFORMATION:

1. Component Failure Information:

The RCP surge protection capacitor is a mylar plastic film, dry type capacitor, Westinghouse part number 633A918A01B.

2. Previous LERs for Similar Events:

None.

3. Trip of MFPs Following Reactor Trip

Following the Unit 3 reactor trip, the FWCS properly generated an RTO signal. Contrary to the expected response, however, both MFPs tripped on high combined MFP discharge pressure. This condition was determined to have been caused by a slow response of the MFPs to the RTO signal. Specifically, the decrease in speed of the MFPs following the reactor trip was not sufficient to prevent an increase in discharge pressure to the trip setpoint as a result of the closing of the MFRVs (and partial closing of the MFBVs).

FWCS dynamic testing, which would normally have been performed following the return to service from the recently completed refueling outage, would most likely have identified the slow response of the MFP's. This testing could not be performed upon return to service due to MFP speed oscillation problems noted during the startup. The speed oscillations were being investigated and resolved when the trip occurred. Dynamic testing has now been completed, and appropriate adjustments have been made to assure a proper MFP response to an RTO signal. No further corrective actions are planned.

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SCE

Southern California Edison Company

SAN ONOFRE NUCLEAR GENERATING STATION  
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SAN CLEMENTE, CALIFORNIA 92674-0128

R. W. KRIEGER June 15, 1992 TELEPHONE  
STATION MANAGER (714) 368-6255

U. S. Nuclear Regulatory Commission  
Document Control Desk  
Washington, D.C. 20555

Subject: Docket No. 50-362  
30-Day Report  
Licensee Event Report No. 92-003  
San Onofre Nuclear Generating Station, Unit 3

Pursuant to 10 CFR 50.73 (d), this submittal provides the required 30-day written Licensee Event Report (LER) for an occurrence involving an automatic reactor trip of San Onofre Nuclear Generating Station, Unit 3. Neither the health nor the safety of plant personnel or the public was affected by this occurrence.

If you require any additional information, please so advise.

Sincerely,

Enclosure: LER No. 92-003

cc: C. W. Caldwell (USNRC Senior Resident Inspector, Units 1, 2 and 3)

J. B. Martin (Regional Administrator, USNRC Region V)

Institute of Nuclear Power Operations (INPO)

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